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ABSTRACT

A practicum was conducted to develop a scientific management tool that would assist students in obtaining a systems view of their college curriculum and to coordinate planning with curriculum requirements. A modification of the critical path method was employed and the result was a time-based network model of the Industrial Engineering Technology curriculum at the Southern Technical Institute. The model pictorially displays the time-phasing and precedence requirements of all courses in the curriculum. Information is provided on the construction and use of the model to permit replication of the method for other structured curricula. A brief literature review and background information on the engineering curriculum are presented. An evaluation of the model indicated student preference for the model over other methods available. Information on course requirements, course descriptions, and an evaluation questionnaire are appended. (SE)

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THE DEVELOPMENT AND EVALUATION OF A TIME BASED NETWORK MODEL OF THE INDUSTRIAL ENGINEERING TECHNOLOGY CURRICULUM AT THE SOUTHERN TECHNICAL INSTITUTE

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A PRACTICUM PRESENTED TO NOVA UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF DOCTOR OF EDUCATION

NOVA UNIVERSITY

October, 1976

HE 011 521

ABSTRACT

Traditionally, the only information available to a student by which he is to view and understand his college curriculum is a list of courses, by academic quarter, and a set of course descriptions with listed prerequisites. In such cases, the student is provided the necessary information, but the method of presentation discourages viewing the curriculum in its entirety, thus inhibiting an understanding of the interrelationships of its various parts.

The purpose of this practicum was to develop a scientific management tool which would assist students in obtaining a systems view of their college curriculum. The development, which employed a modification of the critical path method (CPM), resulted in a time based network model of the Industrial Engineering Technology curriculum at the Southern Technical Institute. The model pictorally displays the time phasing and precedence requirements of all courses in the curriculum. Sufficient detail as to the construction and use of the model is provided in the procedures section of this report to permit replication of the method for other structured curricula.

An evaluation of the model, although not statistically based, indicated a unanimous student preference for the model over other methods available. Copies of the model and this abstract have been distributed to other department heads at the Southern Technical Institute with the recommendation that similar network models be used to depict the other curricula within the Institute.

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STATEMENT OF PURPOSE OF THIS DEVELOPMENT

The desirability of a student understanding not only the total course requirements of his college curriculum but also the interdependence and precedence relationship between its courses is axiomatic. This is particularly desirable and almost imperative when the curriculum is highly structured as in the cases of engineering, law, medicine, or business administration. Traditionally, the students' source of information for developing an understanding of the curriculum is his college catalog which provides only a quarter by quarter course listing and a course description with stated prerequisites. In such cases the student is provided the necessary information, but the method of presentation discourages viewing the curriculum in its entirety, thus inhibiting an understanding of the interrelationship of its various parts.

This practicum was developmental in nature rather than research oriented. Its purpose was to develop a time based network model which would graphically portray the entire curriculum as a system, showing the precedence relationships, sequence and time phasing of the individual courses. The model was designed to foster a more comprehensive understanding of the academic program and provide a tool to aid the student in planning his efforts to meet the total curriculum requirements.

REVIEW OF THE LITERATURE

For a number of years educators have applied scientific management tools to the design, development, implementation and evaluation of the educational process. Terms such as model,

systems concept, flow diagram, and decision table have become commonplace in the pedagog's vocabulary. In the preface to his book, Developing a Systems View of Education(1:V), B. H. Banathy states that the purpose of his work is to help the educator "... acquire a systems view and learn how to apply it to the solution of problems." Banathy's major thrust is the development of models to depict the learning process and its relationship to other sectors of the educational system. In another work, Instructional Systems(2) by the same author, use is made of flow charts in an attempt to describe how learning takes place and how the instructional environment interacts with the education process. Other scientific management tools are applied to the learning situations by Robert Mager in his books, Preparing Instructional Objectives(7) and Analyzing Performance Problems(8). In the former, Mager employs programmed instruction with branching to develop the reader's proficiency in specifying educational objectives. In the latter work, Mager utilizes a decision table to identify the reason for and corrective action appropriate to a performance deficiency. Another example of application of scientific management methods to education is given by Kolz and O'Dell who, writing in Clearing House Magazine(4:75), develop a curriculum flow chart which presents a systematic and structured approach to curriculum development. In the author's words, "It is an organizational design for curriculum study which seeks to involve all staff levels in curriculum study, while serving as a vehicle for obtaining the necessary facts to be weighed in a decision-making process."

Each of the authors cited above used a different scientific management technique to develop, implement, or evaluate some phase of education. There is, however, one strain which remains constant through their writing. In each case the tools and techniques were developed for the educator--never for the student. The tools are used to enhance the educator's task. In a search of the literature not a single writing was discovered which employed scientific management techniques as an instrument to help the student understand or cope with his responsibilities in the educational process. This practicum attempted to overcome that glaring deficiency by providing a time based network model of the curriculum which may be used by the student in his decision making process.

BACKGROUND AND SIGNIFICANCE OF THE STUDY

The Southern Technical Institute is a coeducational residential college for day and evening students. It is a part of the University System of Georgia, and that unit of the Georgia Institute of Technology dedicated to the educational development of engineering technologists. The college, which is located on a separate campus from Georgia Tech has a student body of approximately 2000 and a faculty of 75 full time professional educators. Bachelor degrees are granted in Apparel, Architectural, Civil, Electrical, Industrial, Mechanical, and Textile Engineering Technology. Engineering Technology as defined by the Engineering Council for Professional Development, the accrediting authority for colleges of engineering and engineering technology, is "...part of a continuum extending from the craftsman to the engineer. Located nearest the engineer, it requires the

application of scientific and engineering principles in support of engineering activities."(3:89)

Because of the technical nature of the courses comprising an engineering technology program, the curriculum is highly structured. That is, most of the courses must follow in sequence with the upper division courses having a considerable array of prerequisites. It is frequently difficult for a student to understand the importance of taking certain courses early in the program or to assess the impact on the overall program of dropping or failing a particular course. As stated previously, the only tool generally available to assist in the understanding and assessment is the college catalog which lists the recommended course schedule by academic quarter and a description of each course with its prerequisites. The time based network diagram developed in this practicum provides a graphic model of the curriculum which pictorially displays the interrelationship, and precedences established by the curriculum.

Although the specified model developed was for the Industrial Engineering Technology program at the Southern Technical Institute, sufficient detail as to its construction is provided in the Procedure Section of this report that the method may be replicated and a model constructed of any structured college curriculum.

There are a number of modeling techniques which could have been used to develop a time based network diagram, however, since the resulting model may be used by students and faculty with a minimum knowledge of networking techniques it was imperative that the selected technique provide a simple to construct and easily understood diagram. A modified critical path method (CPM) technique

appears to have the required simplicity. The theory and procedures for constructing a CPM diagram are provided by Moder and Phillips in their text, Project Management with CPM and PERT(9) and by Lavin and Kirkpatrick in their work, Planning and Control with CPM/PERT(5). However, both of the above references are more rigorous in development than required for the current application. Paul A. Montello writing in Educational Technology(10:62-64) discusses the use of a Precedence Diagramming Method (PDM) in educational management. Although Montello's method is directed at budgetary control of the educational system, it does provide a simplified version of the Critical Path Method which with modification could be used for curriculum diagramming. The "Modified Precedence Diagramming Method" developed and illustrated in this practicum is a new technique developed by the author. It combines Montello's simplified version of the critical path method with the time based characteristics of Moder and Phillips.

PROCEDURES

These procedures describe not only how the time based network model was constructed, but are written so as to provide instructions and sufficient narration to facilitate the construction and use of similar diagrams for other curricula.

First, a network diagram worksheet was divided into 12 horizontal sections each representing one academic quarter. The course requirements for each quarter were then extracted from the college catalog (Appendix A) and a box containing the course number was drawn for each course in its appropriate section of the network diagram worksheet. Sufficient space should be provided in each

block for the placement of a date and grade when the course has been completed. Next, the prerequisites for each course were determined from the college catalog (Appendix B) and arrows connecting each of the courses with their prerequisites were drawn.

In constructing the diagram it is important that the constructor as well as the user understand the basic principle of a precedence diagram. That is:

> *Before any activity (course) can begin, all preceding activities (courses connected by arrows) must be completed. Once an activity has been completed any or all succeeding activities may begin.*

Figure 1 illustrates this principle.

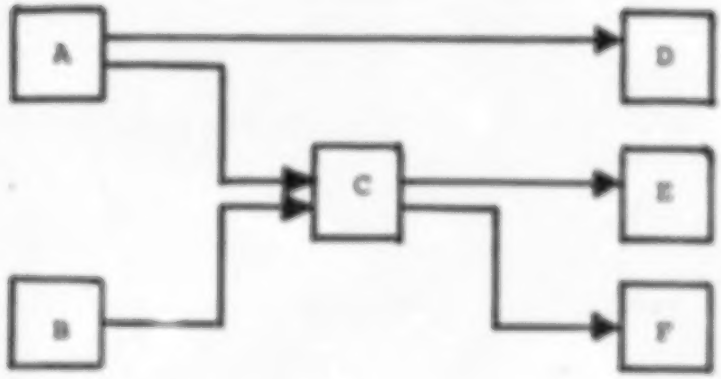

FIGURE 1

PRECEDENCE RELATIONSHIPS

1. *Course D can begin as soon as course A has been completed.*
2. *Course C cannot begin until both courses A and B have been completed.*
3. *Either course E or F or both may begin as soon as C has been completed.*

In the current or time based network model, two special symbols were developed to depict special conditions. A dotted arrow line emanating and terminating in the top or bottom of a course block indicates that the courses may be taken concurrently and the arrowhead indicates which course established the concurrence or precedence as a requirement. Figure 2 illustrates this condition.

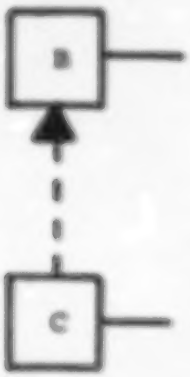

FIGURE 2

CONCURRENCE RELATIONSHIPS

Course B requires that Course C is taken as a prerequisite or concurrently. There is no requirement for B when taking C. If mutual concurrence were required, arrowheads would be shown on both ends of the dotted line.

The second special symbol in this model was the "or gate" ⊗ which indicated that either of two courses would satisfy the prerequisite requirements. Figure 3 on the following page illustrates this principle:

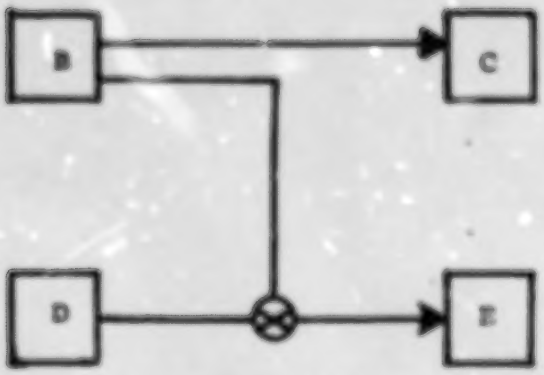

FIGURE 3

THE "OR" GATE

B must be taken before C but either B or D will satisfy the prerequisite for E.

After initially drawing the precedence network, it is generally advantageous to rearrange the relative position of course boxes within each academic quarter in order to minimize the number of crisscrossing precedence arrows and to impart a sense of flow to the network. If particular attention and some creativity are not used in this stage of the construction, the resulting diagram may appear to be merely a maze of lines and boxes making comprehension such a formidable task as to discourage use of the diagram. Finally, major milestones such as the Regents' literacy test, comprehensive examinations, and the filing of a petition to graduate are entered on the network at the appropriate location.

In order to limit the scope of the time based precedence diagram developed in this practicum, it was assumed that a student entering the program had met all entrance requirements of the institution and was not involved in any remediation studies. If

this is not the case, use of the diagram to show current academic status can be deferred until remediation has been completed or, the time based diagram can be expanded to include such remediation activities before entry into the regular academic program.

Since, as studied previously, the diagram may be used by students and faculty unfamiliar with network technique, it is important that a key to the symbols and explanation of the use of the diagram be provided. In this particular case, the key and explanation as well as the course name and credit hours are presented on the reverse side of the diagram. The resulting time based network diagram (Figure 4 on the next page) and its accompanying legend and instructions graphically depict the entire curriculum as a system and provide not only a tool for understanding the curriculum, but a document which when updated quarterly will be useful to the student in planning future work.

To evaluate the usefulness and acceptability of the network diagram, copies were distributed to fifty students selected at random using the Student Identification numbers and a table of random numbers. Each student also received a copy of the current college catalog. A series of questions (Appendix C) concerning course sequences and the curriculum were presented and half of the students were asked to use the network diagram and the other half the catalog in obtaining the answers. A second set of different but similar questions were then asked and the students instructed to use the alternate document. Finally, all students were asked to evaluate whether the catalog or network diagram was easier to

INDUSTRIAL ENGINEERING TECHNOLOGY CURRICULUM (REQUIRED)

Course Number	Title	Hours*
IET 119	Introduction to Industrial Eng. Tech.	3-0-3
IET 130	Data Processing	3-0-3
IET 227	Statistics I	3-0-3
IET 322	Motion and Time Study	4-2-5
IET 326	Wage and Salary Administration	3-0-3
IET 327	Statistics II	4-2-5
IET 334	Production and Inventory Control	3-0-3
IET 339	Quality Control	3-0-3
IET 340	Plant Layout	2-4-4
IET 350	Industrial Safety	3-0-3
IET 431	Project Planning and Control	2-3-3
IET 424	Engineering Economy	3-0-3
IET 465	Synthetic Work Measurement	4-2-5
IMT 313	Accounting and Cost Accounting	4-2-5
IMT 329	Personnel and Labor Relations	3-0-3
IMT 343	Business Law	3-0-3
IMT 344	Management Decision Making	3-0-3
MET 111	Manufacturing Processes	3-0-3
MET 301	Fluid Mechanics	3-0-3
MET 322	Thermodynamics	3-0-3
MET 323	Statics	3-0-3
MET 324	Strength of Materials	3-3-4
EET 432	Electrical Controls	3-0-3
Draw 111	Engineering Drawing I	0-6-2
Phys 201	Mechanics	4-2-5
Phys 202	Electricity and Magnetism	4-2-5
Phys 203	Heat, Sound, Light, Modern	4-2-5
Chem 201	General Chemistry	4-2-5
Math 111	Algebra	3-0-3
Math 112	Trigonometry	3-0-3
Math 114	Analytic Geometry and Calculus	5-0-5
Math 215	Computer Programming (FORTRAN)	3-0-3
Math 200	Calculus II	5-0-5
Econ 220	Economics I	3-0-3
Psyc 112	Psychology	3-0-3
Engl 111	Composition and Rhetoric	3-0-3
Engl 112	Composition and Rhetoric	3-0-3
Engl 211/212	Man and Literature (I or II)	3-0-3
Engl 221	Public Speaking	3-0-3
Engl 231	Technical Writing	3-0-3
Hist 114/115	Western Civilization (I or II)	3-0-3
Hist 251/252	U. S. History	3-0-3

*Hours - Lecture - Lab - Credit

——————▶ Indicates prerequisite requirements

- - - - ▶ Indicates courses may be taken concurrently

⊘ Indicates either course will satisfy prerequisite requirement

After each course is completed, enter the date and grade received in the bottom half of the appropriate box. Electives should be chosen from the general catalog.

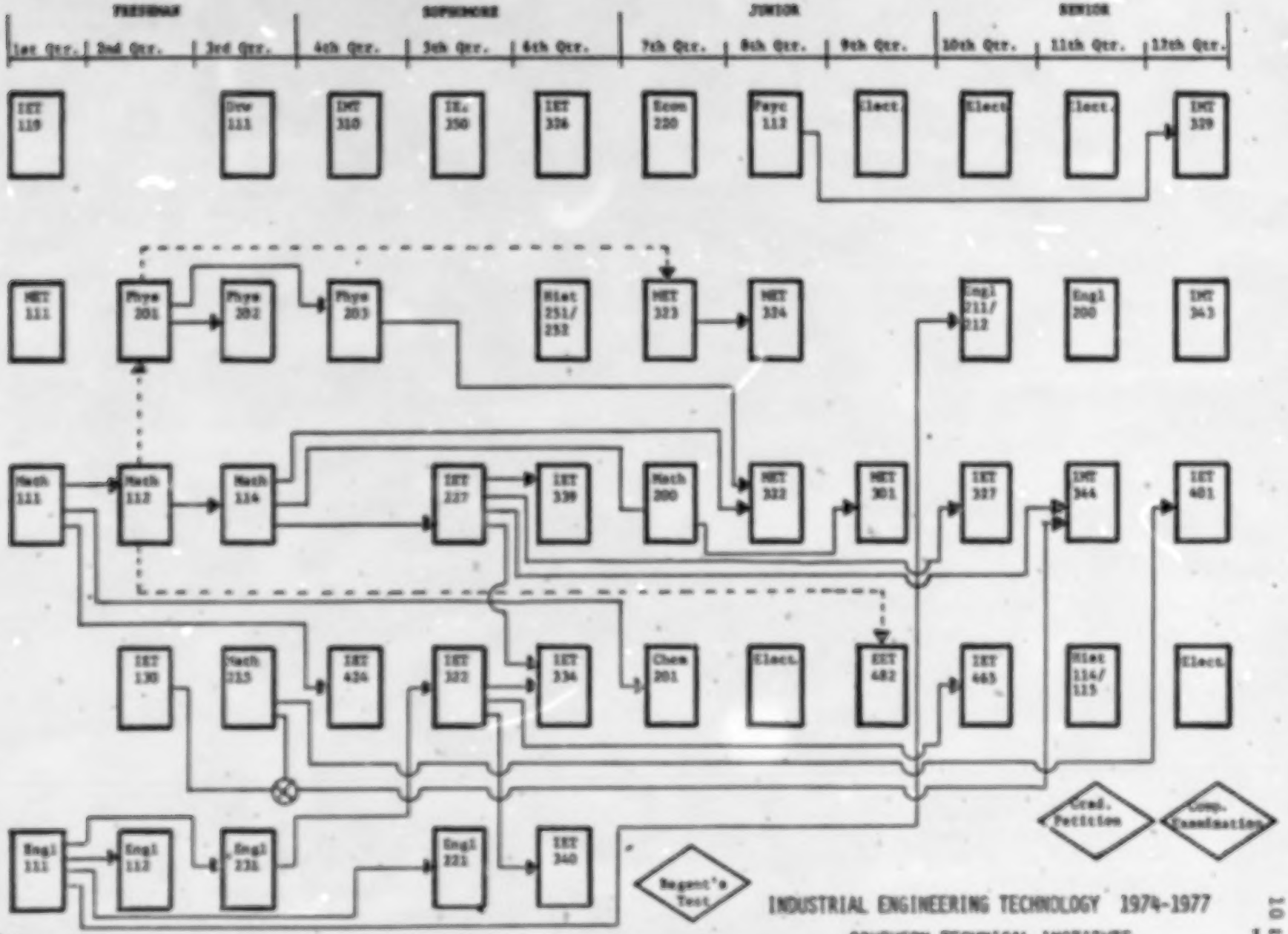

FIGURE 4

INDUSTRIAL ENGINEERING TECHNOLOGY 1974-1977
SOUTHERN TECHNICAL INSTITUTE

use and which afforded a better understanding of the entire curriculum. Although not statistically based, a consensus in favor of the network diagram or the catalog was to constitute an evaluation.

RESULTS

As stated previously, this practicum was developmental rather than research oriented. The result, shown in Figure 4 consists of the time based network model of the Industrial Engineering Technology curriculum at the Southern Technical Institute. The sampling of student reaction to the network although not statistically based, did verify that the diagram was consistently preferred over other methods of curriculum description. Every student surveyed supported the time based network model.

DISCUSSION, IMPLEMENTATION and RECOMMENDATION

Details and precedence for constructing a time based network model of a structured college curriculum were presented in the procedures section of this report. Although the development of the model will improve the developers understanding of the curriculum, that was not the purpose of the practicum. The purpose rather was to develop a tool to enhance the student's understanding of the curriculum and assist in his decision making process. Maximum benefit will only be achieved when the diagram is used by the student. It will be noted that in addition to a full description of the symbols used and the course titles on the reverse side of the diagram space is provided on the diagram for the student to enter the grade received and date that each course is successfully completed. The student should be given a copy of the network diagram when he

initially enters the program and instructed in how to update and use it as a tool to track his progress through the curriculum. In recognition that only by student involvement will maximum benefit of the network model be derived, the time based network model has been made available to every student in the Southern Technical Institute Industrial Engineering Technology program. Although, because of the clerical work involved, the current departmental progress records of IET students will not be converted to the new network diagram; the records for new students will be maintained on the diagram.

Copies of the Industrial Engineering Technology curriculum time based network model and a copy of the abstract of this practicum have been sent to each department head at the Southern Technical Institute with the recommendation that they consider adoption of similar network diagrams in their department. Finally, a copy of the full practicum report has been placed on file in the Institute Library and if deemed worthy by the NOVA grader, will be submitted to ERIC for cataloging.

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11. Trujillo de Rio and others. "Academic Program Planning by a Network Analysis," Journal of Chemical Education, (August, 1970), pp. 548-52.

APPENDIX A

Course Requirements

INDUSTRIAL ENGINEERING TECHNOLOGY

ASSOCIATE DEGREE PROGRAM

First Year

Course	No.	Subject	1st Q.	2nd Q.	3rd Q.
Draw	111	Engineering Drawing I	.....	.....	0-6-2
Engl	111	Composition & Rhetoric	3-0-3	.....	.....
Engl	112	Composition & Rhetoric	.....	3-0-3	.....
Engl	231	Technical Writing	.....	.....	3-0-3
IET	119	Intro. to Industrial Eng. Technology	3-0-3	.....	.....
IET	130	Data Processing	.....	3-0-3	.....
Math	111	Algebra	5-0-5	.....	.....
Math	112	Trigonometry	.....	5-0-5	.....
Math	114	Analytic Geometry & Calculus	.....	.....	5-0-5
Math	215	Computer Programming	.....	.....	3-0-3
MET	111	Manufacturing Processes	5-0-5	.....	.....
Phys	201	Mechanics	.....	4-2-5	.....
Phys	202	Electricity & Magnetism	.....	.....	4-2-5
		Totals	16- 0-16	15- 2-16	15- 8-19

Second Year

Course	No.	Subject	1st Q.	2nd Q.	3rd Q.
Engl	221	Public Speaking	.....	3-0-3	.....
Hist	251 or 252	U.S. History	.....	.....	5-0-5
IMT	310	Accounting & Cost Accounting	4-2-5	.....	.....
IET	350	Industrial Safety	.....	3-0-3	.....
IET	322	Motion & Time Study	.....	4-2-5	.....
IET	227	Statistics	.....	5-0-5	.....
IET	334	Prod. & Inventory Control	.....	.....	3-0-3
IET	339	Quality Control	.....	.....	3-0-3
IET	340	Plant Layout & Materials Handling	.....	.....	2-4-4
IET	326	Wage & Salary Administration	.....	.....	3-0-3
IET	424	Engineering Economy	5-0-5	.....	.....
Phys	203	Heat, Sound, Light, Modern	4-2-5	.....	.....
		Totals	13- 4-15	15- 2-16	16- 4-16

BACCALAUREATE DEGREE PROGRAM

Third Year

Course	No.	Subject	1st Q.	2nd Q.	3rd Q.
*MET	355	Statics	3-0-3	.....	.....
*MET	324	Strength of Materials	.....	3-3-4	.....
Chem	201	General Chemistry	4-2-5	.....	.....
Econ	251	Economics I	5-0-5	.....	.....
IET	412	Electrical Circuits	.....	.....	5-0-5
Math	260	Calculus II	5-0-5	.....	.....
MET	341	Fluid Mechanics	.....	.....	5-0-5
MET	327	Thermodynamics	.....	5-0-5	.....
Psych	152	Psychology	.....	5-0-5	.....
		Free Electives	.....	5-0-5	5-0-5
		Totals	17- 2-18	18- 3-19	15- 0-15

*Note: The student may elect CET 313 and CET 314 in lieu of these two MET courses. He must select four such courses in MET or engineering courses [illegible].

Fourth Year

Course	No.	Subject	1st Q.	2nd Q.	3rd Q.
IET	465	Work Measurement	4-2-5	.....	.....
Engl	200	Language & Logic	.....	3-0-3	.....
Engl	211 or 212	Man & Literature of the [illegible]	5-0-5	.....	.....
Hist	114 or 115	Western Civilization of the [illegible]	.....	5-0-5	.....
IET	327	Statistics II	4-2-5	.....	.....
IMT	329	Personnel & Labor Relations	.....	.....	5-0-5
IMT	343	Business Law	.....	.....	3-0-3
IMT	344	Management Decision Making	.....	5-0-5	.....
IET	401	Process Planning & Control	.....	.....	2-2-3
		Free Electives	3-0-3	3-0-3	3-0-3
		Totals	16- 4-18	16- 0-16	15- 2-14

Students who have completed the Management Option Associate Degree Program may enter this program without loss of credit. They will be required to take the following courses in addition to the courses listed on this page: IET 370, IET 339, IET 326, and MET 111. Total [illegible] beyond the Associate Degree Program.

Note: Under Quarter [illegible] to receive [illegible] credit.

APPENDIX B

Catalog Course Descriptions

IET 119 — An Introduction to Industrial Engineering Technology
3-0-3.

A study of the relationships of the industrial engineering technician with the profit-making enterprise. Emphasis is placed on organizational principles, the functions of the major departments of an enterprise, and practices in manufacturing processes and production methods. This course must be taken during the IET student's first quarter at Southern Tech because of its introductory nature.

IET 130 — Data Processing
3-0-3.

An introduction to the use and limitations of data-processing equipment with particular emphasis on the digital computer. Elementary programming techniques in the BASIC computer language are studied through hands-on experience with an interactive computer terminal.

IET 227 — Statistics I
3-0-3. Prerequisites — Math 114, Math 215.

An introduction to descriptive and inductive statistics with emphasis placed on inductive statistics. Frequency distributions, measures of location and variation, probability, estimation, and tests of hypotheses are covered.

IET 313 — Human Factors in Engineering Technology
3-0-3. Prerequisite — Psychology 112.

The systematic application of relevant information about human characteristics and behavior to the design of both the things people use and the methods of their use, and to the design of the environments in which people work and live. This includes topics such as human information processing, physical output activities, workspace and arrangement, and working environment.

IMET 310 — Accounting and Cost Accounting
4-2-5

A basic study of general accounting principles, particularly in their relationship to the systematic recording, organizing, and analysis of accounting data for effective management decisions.

Emphasis is placed upon systems of cost control in job order, process, standard and direct costing systems, and recording and control of material, direct labor, and overhead cost.

IMET 316 — Principles of Management
3-0-3.

An introduction to the principles of organization for non-Industrial Engineering Technology students. The basic factors involved in the organization and operation of a business enterprise are studied.

IET 321 — Motion and Time Study
4-2-5. Prerequisite — Engl 231.

An introduction to the field of motion and time study. The use of charts and the principles of motion economy. Time study methods and practice; standard data, work sampling and the use of predetermined time data. Laboratory and class are closely coordinated to give practical application to theory.

IET 326 — Wage and Salary Administration
3-0-3

This course is an attempt to bring together important wage and salary compensation concepts concerning the range of parties involved. Primary emphasis is placed on compensation theory and compensation practice. It is concerned with how an employing organization makes choices concerning compensation based on the aggregate actions of each member or organized group concerned with wage levels and wage structure.

IET 327 — Statistics II
4-2-5. Prerequisite — IET 227.

Continuation of inductive statistics. Analysis of variance, binomial distribution, Poisson distribution, linear regression and correlation will be introduced. Computer application to statistical problem solutions.

IMET 329 — Personnel and Labor Relations
3-0-3. Prerequisite — Psych 112.

The application of sound principles of psychology and established management practices in personnel and labor relations, with special emphasis on individual and group behavior. The techniques of conference leadership and employee training are developed in the analysis and demonstration of actual case problems from industry. Special attention is given to the organized labor movement, collective bargaining and government regulations, and the administration of management-union agreements. Grievances related to wages, hours, and working conditions are analyzed with consideration for prevention measures in personnel and labor relations.

The major objective of the course is to suggest to the student systematic and scientific approaches to management in areas of personnel and labor relations.

IET 334 — Production and Inventory Control
3-0-3. Prerequisites — IET 322 and IET 227.

The concepts of a basic production control system are covered. The requirements of production control for both continuous and intermittent manufacturing are covered. Case studies are used. Fundamentals of inventory control methods are treated as an integral part of the production control system.

IET 339 — Quality Control
3-0-3. Prerequisite — IET 227.

An introduction to statistical quality control covering control charts for variables, control charts for attributes, and acceptance sampling.

IET 340 — Plant Layout and Materials Handling
3-0-4. Prerequisites — Fifth quarter standing and IET 322 or AMET 465.

Principles of plant layout, process and flow charts, tools and aids for effective plant layout, case studies; the supervisor's responsibility for building and equipment maintenance.

IMET 341 — Finance
3-0-3

A treatment of the forces affecting the demand and the supply of funds in the capital market. The capital-markets approach provides a bridge between economic theory and the problems of financial management. Included in the study will be the nature and role of finance in our economy, as well as short-term financing, trade credit, long-term financing, its forms and reasons for such financing, as well as its limitations. Savings by corporate institutions will be discussed. Recent monetary and credit problems and policies will be studied.

IMET 342 — Small Business Management
3-0-3. Prerequisite — Junior standing.

A study of management in an independent business. The choice of business organizations, essential records and accounting controls, financing the independent business, taxation as a factor in management decisions, systems of planning, directing and controlling business operations, and formation of business policies pertaining to forecasting, financing, and marketing the products and services of the independent business.

IMET 343 — Business Law
3-0-3.

The general laws of contracts, agency, sales agreements, and engineering specifications are incorporated into contracts, the business, legal, and ethical phases of engineering.

IMET 344 — Management Decision Making
3-0-3. Prerequisites — IET 227 and either Math 215 or IET 130.

Business decision making here is considered to be the process whereby management, when confronted by a problem, selects a specific course of action from a set of possible courses of action. The course is primarily concerned with the process of placing a value on alternative

courses and choosing the optimum course through quantitative analysis. Quantitative techniques such as probabilistic models, linear programming and queueing theory are applied to areas in inventory, distribution, and capital expenditures.

IMT 349 — Marketing
3-0-3.

A basic survey of marketing's place within the American economy, including the special aspects of some major management problems, and the factors that influence consumer choice; costs and margins; sales, pricing problems, and policies. Problems of advertising policies, as well as those of transportation, will be covered. Topics regarding the overall aspects of wholesaling and retailing will be covered in depth with emphasis being placed on the contemporary status and trends in retailing, on both the large and small scales. Aspects of governmental controls and foreign competition will be covered by student preparation of reports on these topics.

IET 350 — Industrial Safety
3-0-3.

A basic study of industrial accident prevention considering the nature and causes of the accident problem. The role management must play in industrial safety, the information it must have to insure an efficient, well-managed safety program with particular emphasis on fire prevention, industrial hygene, accident cost, compensation, insurance, and safety organization.

IET 351 — Manufacturing Safety
3-2-3. Prerequisite — IET 350 or prior consent of instructor.

This course introduces the student to safe practices in manufacturing operations and their relationship to Federal regulations. This includes the safe operation of machine tools, woodworking machinery, metal working, apparel and textile operations, and electrical hazards. The student will have a sound base of what constitutes safe practice and how the Federal laws relate to these areas.

IET 354 — Plant Safety
3-0-3. Prerequisite — IET 350 or prior consent of instructor.

This course introduces the student to safe practices in plant design layout, materials handling, fire safety, and their relationship to federal regulations. This includes industrial and office layout, materials-handling equipment, noise control and fire control. The student will have a sound base of what constitutes safe practice and how the Occupational Safety and Health Laws relate to these areas.

IET 357 — Industrial Hygiene
3-0-3. Prerequisite — IET 350 or prior consent of instructor.

This course introduces the student to the field of industrial hygiene. This includes recognition, evaluation, and prescription of environmental factors which influences health. Specific areas of interest include chemical, physical, biological, and ergonomic stressors a worker experiences while on the job.

IMT 365 — Income Tax Accounting
3-0-3. Prerequisite — IMT 310 or consent of instructor.

The study of individual income tax accounting. Some of the areas that will be covered are: Income from a proprietorship, farm income, rental income, retirement income, capital gains or losses from other stocks or other assets and income averaging. Emphasis is placed on the student's being able to prepare any individual tax return. Elective course to be offered on demand.

IMT 375 — Business Law II
3-0-3. Prerequisite — IMT 343 or consent of instructor.

The study of the general law of Property, Sales, Commercial Paper, Partnerships, and Corporations. Emphasis is placed upon case analysis. Elective course to be offered on a demand basis.

IET 391-395 — Special Topics
Variable Credit — 1 to 5 hours. Prerequisite — Junior standing or consent of instructor.

Special problems selected by department. Offered on a demand basis.

IET 401 — Project Planning and Control
3-2-3. Prerequisite — Fourth-year standing and Math 215.

The use of the Critical Path Method in planning, scheduling, and controlling projects. Both the Critical Path Method (CPM) and the Program Evaluation and Review Technique (PERT) will be presented. Other modern scheduling techniques may be introduced.

IMT 416 — Modern Trends in Management
3-0-3. Prerequisite — Fourth-year standing, IET or IMT major.

The impact of modern technical developments and system analysis on management. Current thinking in environmental technology management, industrial organization, project and process management.

IET 424 — Principles of Engineering Economy
3-0-3. Prerequisite — Math 111.

Output and life of equipment, operation costs, depreciation rates, economic selection of equipment, determination of economic lot sizes, and cost studies on representative problems.

IET 465/AMET 465 — Synthetic Work Measurement
4-2-5. Prerequisite — IET 322.

An introduction to the field of work measurement including an emphasis on predetermination time systems and standard data. Interest is focused on creation and application of standard times, especially Methods Time Measurement. Laboratory and classes are closely coordinated to the practical application of theory.

IET 491-495 — Special Topics
Variable Credit — 1 to 5 hours. Prerequisite — Junior standing or consent of instructor.

Special problems selected by department. Offered on a demand basis.

APPENDIX C

Evaluation Questionnaire

EVALUATION OF TIME BASED NETWORK DIAGRAM OF

INDUSTRIAL ENGINEERING TECHNOLOGY CURRICULUM

PART I If the last digit of your alpha number is even use the Network Diagram to answer the following questions. If the digit is odd, use the college catalog.

1. Is there a prerequisite to taking Economics 220?
2. Can you take IET 339 if you have not yet passed Math 114?
3. Can you defer taking MET 323 without delaying any other course?
4. In which quarter are you required to file a petition to graduate?

PART II Now use the alternate source to answer the following questions.

5. Is there a prerequisite for Phys 203?
6. Can you take IET 465 if you have not yet passed Engl 231?
7. Can you delay taking IET 334 without delaying any other course?

Answers to above questions:

1. No.
2. No, IET 227 is a prerequisite to IET 339 and Math 114 is a prerequisite to IET 227.
3. No, MET 324 must then be delayed.
4. Eleventh quarter.
5. Yes, Phys 201.
6. No, IET 465 requires IET 322 which has Engl 231 as a prerequisite.
7. Yes.
8. Seventh quarter.

PART III

A. Which did you find easier to use?

Network Diagram _____ Catalog _____

B. Which do you think is more useful in understanding the curriculum as a whole?

Network Diagram _____ Catalog _____

Writer's Name James W. Bannerman

Cluster Greenville, South Carolina

I certify that I have read this practicum report and have discussed its contents with the writer.

12/3/76 (date)

(signature of peer reader)

I certify that I have read this practicum report and have discussed its contents with the writer.

12/3/76 (date)

(signature of peer reader)

I certify that I have read this practicum report and have discussed its contents with the writer.

12-3-76 (date)

(signature of peer reader)

.....

I certify that I have read this practicum report and that in my opinion it conforms to acceptable standards for practicums in the Doctor of Education Program.

(date)

(signature of Practicum Director)